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FLIGHT INSPECTION AIRCRAFT SYSTEM
Request For Proposal
DTFA01-92-R-06302

C.2
FLIGHT INSPECTION AIRCRAFT SPECIFICATION
FAA-A-2876

212

CONTENTS

CONTENTS - Continued

APPENDIX I

APPENDIX II

TABLES

ILLUSTRATIONS

FLIGHT INSPECTION AIRCRAFT

1. SCOPE

1.1 Scope. This specification defines the minimum performance and functional requirements for three classes of current production, fuel efficient, pressurized, multi-engine, turbine powered aircraft equipped with specialized equipment, accessories, and aircraft systems, which operate as an integrated system, comprising an FAA flight inspection aircraft with automatic flight inspection capabilities. Each aircraft will frequently operate at low altitudes and at maximum gross weight. The operating environment is worldwide and encompasses ambient temperatures to both high and low extremes.

1.2 Classification. The aircraft defined in this specification consists of the three classes listed below (see 3.3.2.2.1 for cabin size requirements).

a. Medium size/medium range (MSR). This class of aircraft shall be a turbine powered airplane, certified for gravel runway operations, used to perform flight inspection missions. The standard example mission is a one-way, en route flight of 500 nautical miles, with 3 hours of on-station flight at 2,000 feet MSL, at 240 ± 10 knots. The aircraft must have sufficient fuel capacity to complete the standard mission plus have enough fuel for an alternate airfield (assuming an alternate airfield to be 150 nautical miles) and have 45 minutes reserve at normal cruise. (FAR 91.167 requirement)

b. Large size/long range (LSR). This class of aircraft shall be a turbofan powered airplane, used to perform the long range flight inspection mission. The aircraft must have a minimum cross-country cruise range of 3,500 nautical miles, to dry tanks, at optimum speed and altitude, while in a fully loaded standard mission configuration. It must be equipped with dual HF systems and triple inertial systems.

c. Multi-Mission (MM). This class of aircraft shall be a turbine powered airplane, used to perform the missions listed below.

(1) Semi-Automatic Flight Inspection (SAFI)
(2) Automatic Flight Inspection (AFIS)
(3) Logistics Requirements

In order to perform the various missions, the aircraft shall have the following characteristics:

(1) A large physical size to facilitate unrestricted antenna placements and to provide space for SAFI and AFIS and still have logistic capability
(2) Cross country cruise range of 2,200 nautical miles, minimum, to dry tanks, at optimum speed and altitude, while in a fully loaded standard mission configuration
(3) Gravel runway certification
(4) Cargo door/ramp and cargo floor
(5) Steep angle approach certification

1.3 Flight Inspection Mission Profile. A typical FAA mission profile consists of the following mission segments. The annual utilization rate of the flight inspection aircraft is 800 flight-hours.

ACTIVITY	LSR	MSR	MML	MMS
En Route Time	56%	32%	60%	25%
On Station Time	44%	68%	40%	75%
Gear Down Time	5%	10%	2%	2%
High Power Setting	7%	9%	5%	5%
Time Below 2000' AGL	42%	66%	25%	1%
Flap Cycles/1,000 Hours	1,110	1,460	400	200
Gear Cycles/1,000 Hours	1,110	1,460	400	200
Low Approaches/1,000 Hours	590	780	400	0
Landing Approaches/Landings/ 1,000 Hours	510	680	200	200
Engine Cycles/1,000 Hours (Cycle means one start, takeoff, landing and engine shut-down).	510	750	200	200

MSR = Medium Size/Medium Range
LSR = Large Size/Long Range
MML = Multi-Mission Logistics/AFIS
MMS = Multi-Mission SAFI

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. The order of precedence, in the event conflict or inconsistency between any of the following documents shall be:

(1) Code of Federal Regulations
(2) International Civil Aviation Organization (ICAO) Standards
(3) Military Standards and Specifications
(4) Industry specifications
(5) Technical Standard Orders
(6) Technical Issuance Engineering Orders (TIEO)
(7) Advisory Circulars, flight inspection maneuvers related documents, and other publications

Code of Federal Regulations:

Code of Federal Regulations (CFR), Title 14 Aeronautics and Space, Chapter I, Federal Aviation Administration Federal Aviation Regulation (FAR) including:

(1) FAR Part 21	Certification Procedures for Products and Parts
(2) FAR Part 25	Airworthiness Standards: Transport Category Airplanes
(3) FAR Part 36	Noise Standards: Aircraft Type and Airworthiness Certification
(4) FAR Part 91	General Operating and Flight Rules
(5) FAR Part 121	Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operations of Large Aircraft

Code of Federal Regulations, Title 29, Chapter XVII, Occupational Safety and Health Administration (OSHA), Department of Labor

Code of Federal Regulations, Title 40, Part 87, Emission

ICAO Standards:

ICAO Annex 8, Airworthiness of Aircraft

Military Specifications:

MIL-S-8806B, Sound Pressure Levels in Aircraft, General Specification

NACSIM-5203, Criterion for Installing Classified Information Processing Equipment in Aircraft

Military Standards:

MIL-STD-203F, Aircrew Station Controls and Displays: Assignment, Location, and Actuation of, for Fixed Wing Aircraft

MIL-STD-704D, Electric Power, Aircraft Characteristics and Utilization Of

MIL-STD-1472D, Human Engineering Design Criteria for Military Systems, Equipment and Facilities

MIL-STD-25212, Control Panel, Console Type, A/C Equipment, Basic Dimensions

Industry Specifications:

RTCA DO-160B/C Environmental Conditions and Test Procedures for Airborne Equipment

RTCA DO-170 Audio Systems Characteristics and Minimum Performance Standards - Aircraft Microphones (Except Carbon), Aircraft Headsets and Speakers, Aircraft Audio Selector Panels and Amplifiers

RTCA DO-178A Software Considerations in Airborne Systems and Equipment Certification

ARINC-404A, Air Transport Equipment Cases and Racking

ARINC-429, Mark 33 Digital Information Transfer System

ARINC-573, Mark 2 Aircraft Integrated Data System (AIDS Mark 2)

ARINC-615, Airborne Computer High Speed Data Loader

ARINC-709, Mark 5 Airborne Distance Measuring Equipment

ARINC-717, Flight Data Acquisition and Recording System

Technical Standard Orders:

TSO C2b/c	Airspeed Indicators
TSO C3b/c	Turn and Slip Indicator
TSO C4c	Attitude (Bank & Pitch) Instruments
TSO C6c	Direction Instruments Gyro Magnetic Stabilized
TSO C7c/d	Direction Instruments, Magnetic Non-Stabilized Type (Standby Compass)
TSO C9c	Automatic Flight Control Systems
TSO C10b	Air Data Computer (Pressure Altimeter)
TSO C34c/d	ILS Glide Slope Equipment Operating within 328.6 to 335.4 Megahertz

TSO C35d	Marker Beacon Equipment
TSO C36c/d	ILS Localizer Receiving Equipment
TSO C40a/b	VOR Radio Receiving Equipment Operating within the Radio Frequency Range of 108-118 Megahertz
TSO C41c/d	Airborne Radio Receiving and Direction Finding Equipment (LF-ADF)
TSO C46a	Maximum Allowable Airspeed Indicator Systems
TSO C51a	Flight Data Recorder
TSO C52a/b	Flight Directors
TSO C60b	Airborne Area Navigation Equipment Using Loran-C Inputs
TSO C63c	Airborne Weather Radar and Ground Mapping Pulse Radars
TSO C66b	Airborne DME
TSO C72b	Individual Flotation Devices
TSO C78	Crewmember Demand Oxygen Masks
TSO C84	Cockpit Voice Recorder
TSO C87	Airborne Low Range Radio Altimeter
TSO C89	Oxygen Regulators, Demand
TSO C91a	Emergency Locator Transmitters
TSO C99	Protective Breathing Equipment
TSO C112	Mode-S Transponder
TSO C119	TCAS II
TSO C120	Airborne Area NAV Equipment using Omega/VLF Inputs
TSO C123	Cockpit Voice Recorder
TSO C124	Flight Data Recorder Systems

Technical Issuance Engineering Orders (TIEO):

89-E-6 Structural Integrity Program and Engine Trend Monitoring Recording System

91-E-11 SAFI Audio/Oscilloscope Waveform Multiplexer (FA65.9-A-070) Specifications

91-E-13 AFIS/SAFI NCU Specifications

FAA Drawing 4110120, Rev. 4 (3/6/91), Exterior Paint Scheme

Advisory Circulars:

AC 20-30B, Aircraft Position Light and Anti-Collision Light Installations

AC 20-42C, Hand Fire Extinguishers for Use in Aircraft

AC 20-101C, Airworthiness Approval of Omega/VLF Navigation Systems for the United States NAS and Alaska

250

AC 20-121A, Airworthiness Approval of Loran-C Navigation Systems for use in the U.S. National Airspace System (NAS) and Alaska

AC 20-130, Airworthiness Approval of Multisensor Navigation Systems for use in U.S. National Airspace System and Alaska

AC 20-131, Airworthiness and Operational Approval of Traffic Alert and Collision Avoidance System (TCAS-II) and Mode-S Transponders

AC 20-136, Protection of Aircraft Electrical/Electronic Systems

AC 25-4, Inertial Navigation Systems (INS)

AC 25-11, Transport Category Airplane Electronic Display Systems

Flight Inspection Maneuvers Related Documents:

FAA Order Number 4040.9D, Operation of FAA Aircraft

FAA Order OA P 8200.1 (Change 46), United States Standard Flight Inspection Manual (1/91)

FAA Order Number 8240.9C, VOR/VORTAC System Improvements (7/85)

FAA Order Number 8240.39A, Operational Procedures for the Automatic Flight Inspection System (AFIS) (8/82)

FAA Order Number 8240.45, Flight Inspection of Type II ILS Facilities used for Category III Operations (5/82)

FAA Order Number 8240.47, Determination of ILS Glidepath Angle, Reference Datum Heights, and Ground Point of Intercept (5/83)

FAA Order Number 8240.50, Flight Inspection of Microwave Landing Systems (1/2/90)

FAA Order Number 8260.34, Glideslope Threshold Crossing Height Requirement

FAA Action Notice A8200.12, Loran-C Flight Inspection of Non-precision Approaches (7/27/90)

General Notice (GENOT) 8200.33, Flight Inspection 75 MHz Marker Beacons (4/30/91)

3. REQUIREMENTS

Note: Unless stated otherwise, all requirements pertain to all three classes of aircraft.

3.1 General. The contractor shall furnish a new, current production, fuel efficient, pressurized, multiengined, turbine powered aircraft equipped with specific equipment and systems which operate as an integrated system to properly perform the following missions:

a. MSR: Domestic flight inspection utilizing the Automatic Flight Inspection System (AFIS)

b. LSR: Long range flight inspection utilizing AFIS

c. MM: Flight inspection using AFIS, mass sampling flight inspection utilizing the Semi-Automatic Flight Inspection (SAFI) system, and logistics

3.1.1 Certification. The aircraft shall have a Standard Airworthiness Certificate issued in the Code of Federal Regulations (CFR), Part 25, Transport Category, or equivalent. The aircraft shall be certificated for day, night, Instrument Meteorological Condition (IMC), Instrument Flight Rules (IFR), shall contain ditching provisions, and shall be certified for flight into known icing conditions. The aircraft shall meet Federal Aviation Regulation (FAR) 36.201 noise requirements.

3.1.1.1 Category II Operation. The aircraft shall be certified for Category II flight operations (reference FAR 91, Appendix A).

3.1.1.2 International Operation. The aircraft shall comply with ICAO Annex 8 (Airworthiness of Aircraft) for international operations requirements.

3.1.1.3 Gravel Runway Operations (MSR and MM). The MSR and MM aircraft shall be certified for operations from a gravel surface runway. Certification shall be in accordance with FAR 25.105 through 25.113 for takeoff and FAR 25.125 for landing, except that the runway specified in FAR 25.105(c)(1) and 25.125(b) shall be a gravel surface runway, graded and free of ruts, with a minimum California Bearing Ratio (CBR) of 20.

3.1.2 Interference.

3.1.2.1 Induced and Radiated Interference. The aircraft shall perform its intended mission without induced interference, vibration, fluctuations, or other characteristics which adversely affect the flight inspection or avionics systems.

3.1.2.2 Electrical/Electronic Energy Protection. The aircraft shall comply with FAA Advisory Circular AC 20-136.

3.1.2.3 Static Discharge. The aircraft shall have external static dischargers installed which provide precipitation static protection for all installed equipment.

3.1.3 Equipment.

3.1.3.1 Performance. The contractor shall ensure that all equipment meets manufacturer's published performance standards after installation in the aircraft. The contractor shall ensure compatibility among all equipment installed in the aircraft. These requirements shall apply both while operating on the ground and during flight.

3.1.3.2 Condition. All Contractor Furnished Equipment (CFE) shall be new. All equipment shall be accompanied by proper documentation certifying serviceability and calibration as appropriate.

3.1.4 Wiring. All wiring shall be installed in accordance with standard industry practices and the following requirements.

a. Wiring shall be of sufficient length to allow each front-mount indicator, instrument, and control unit to be removed from its corresponding enclosure/panel and remain connected.

b. All wiring and coaxial cables shall be clearly identified by printed wire numbers.

c. Electrical connectors containing contacts smaller than 20 gauge shall not be used except as required to install equipment.

3.1.5 Interchangeability. Within each of the three aircraft classes (MSR, LSR, and MM), the following requirements shall apply.

a. Each component in each aircraft shall be completely interchangeable and shall be installed in the same location as the corresponding component in each of the other aircraft of that class.

b. Each wire in each aircraft shall be the same type, the same color, and have the same wire number as the corresponding wire in each of the other aircraft of that class.

c. The structure of the aircraft body, interior, and racking shall be alike among all aircraft within each class. All removable parts, racks, consoles, and panels shall be interchangeable among all aircraft within each given class.

3.1.6 Maintainability.

3.1.6.1 En Route Turnaround Time (ETAT). ETAT is hereby defined as the time in clock minutes and the number of personnel required to complete servicing of aircraft fuel and oil. ETAT shall be a maximum of 30 minutes using no more than two personnel.

3.1.6.2 Full Service Turnaround Time. Full service turnaround time is hereby defined as the total time in clock minutes and the number of personnel required to complete full servicing activities. The requirement for full service turnaround time is a maximum of 90 minutes using no more than four personnel.

3.1.6.3 Accessibility. Each line replaceable unit (LRU) shall facilitate installation and removal such that in no case shall the physical removal or installation of any LRU require more than five minutes by one technician.

3.1.6.4 Component Identification. Durable labels shall be installed throughout the aircraft to indicate the location of each electrical/electronic component.

3.1.6.5 Maintenance Plan. The continuing airworthiness and/or maintenance requirements shall be specified in a Continuous Airworthiness Maintenance Program (CAMP).

3.1.7 Reliability.

3.1.7.1 Aircraft Service Life. The aircraft shall have a service life of at least 20,000 flight-hours at the mission profile described in 1.3.

3.1.7.2 Corrosion. The contractor shall utilize current corrosion preventative processes, finishes, primers, and top coats, compatible with the materials used in construction of the aircraft. Use of dissimilar metals shall be kept to a minimum.

3.1.7.3 Mission Completion. System reliability is defined as the probability that an aircraft will complete an assigned mission, given that the aircraft is initially capable of performing the mission. System reliability shall be at least 85 percent for a flight inspection mission.

3.1.8 Availability. The availability requirement for the aircraft is stated in terms of mission capable (MC) rates. The MC rate is the sum of fully mission capable (FMC) and partially mission capable (PMC) rates. FMC rate is the percentage of possessed clock time during which an aircraft is capable of completing all assigned missions. PMC is the percentage of possessed clock time during which an aircraft is capable of performing at least one of its assigned missions. The aircraft shall have a minimum MC rate of

85 percent with a maximum PMC of 10 percent. Appendix I provides additional instruction for calculation of the MC rate.

3.2 Definitions. Definitions and acronyms listed herein form a part of this specification.

3.2.1 Automatic Flight Inspection System (AFIS). AFIS is a computer controlled data acquisition and recording system used to evaluate performance of ground based navigational aids such as VOR, ILS, MLS, TACAN, and marker beacon. Within the context of this specification, AFIS consists of the AFIS NCU, AFIS radio navigation sensors, AFIS peripherals, and all wiring, components, etc., required to perform the AFIS mission. Using aircraft position derived from DME and IRS sensors, AFIS provides an area navigation function with outputs for EFIS/FCS interface and also generates error curves for the ground navigation aids being inspected.

3.2.2 AFIS Navigation Computer Unit (AFIS NCU). The AFIS NCU is a special computer designed and built specifically for the FAA. It is housed in a 1 ATR enclosure and utilizes a triple gang ARINC 404 connector. The AFIS NCU contains several microprocessors which work together to control all AFIS operations. The AFIS NCU also contains electronic circuits which allow the internal microprocessors to interface with other equipment associated with the AFIS mission.

3.2.3 AFIS/SAFI NCU. The AFIS/SAFI NCU is an AFIS NCU, modified to perform SAFI tasks in addition to AFIS tasks. The AFIS/SAFI NCU is applicable only to the MM aircraft. With the AFIS/SAFI NCU in the AFIS mode, it will perform all AFIS functions applicable to the MM aircraft, just as if replaced by a standard AFIS NCU.

3.2.4 Category II Flight Operations. Reference FAR Part 91, Appendix A.

3.2.5 Control Display Unit (CDU). Operator interface consisting of a multi-line display (usually CRT type) and an integral keyboard (usually providing arbitrary alphanumeric entry). A CDU is associated with a navigation computer unit such as that found in AFIS and in flight management systems.

3.2.6 Certificated. Having an official certificate of compliance with the applicable Federal Aviation Regulations (FAR), including all special FAR's which may be applicable to the certification requirements. Certification applies to aircraft, power plants, and propellers.

3.2.7 Console. Console refers to the flight inspection console and is the flight inspection technician's work station. In the MSR and LSR aircraft, the console shall be used for AFIS only and

accommodate one technician. In the MM aircraft, the console shall be used for AFIS and SAFI and shall accommodate two technicians.

3.2.8 COTR. Contracting Officer Technical Representative

3.2.9 Crew Member. Pilot, copilot, observer (cockpit observer), or flight inspection technician

3.2.10 dBi. Decibel Isotropic

3.2.11 DME. Distance Measuring Equipment

3.2.12 EFIS. Electronic Flight Instrumentation System

3.2.13 EPTM/SI. Engine Performance Trend Monitoring/Structural Integrity System

3.2.14 FMS. Flight Management System

3.2.15 GPIRU. An inertial reference unit receiving positioning information from a GPS sensor. The GPIRU provides guidance information in three forms: inertial derived, GPS derived, and hybrid GPS/inertial.

3.2.16 GPS. Global Positioning System

3.2.17 IFR. Instrument Flight Rules

3.2.18 IRS. Inertial Reference Sensor. The inertial platform for the inertial navigation system.

3.2.19 IRU. Inertial Reference Unit. See IRS.

3.2.20 ISA. International Standard Atmospheric (29.92 inches Hg at 15°C at sea level)

3.2.21 IVSI. Instantaneous Vertical Speed Indicator.

3.2.22 LSR. Large size/long range aircraft. Refers to one class of aircraft to which this specification applies.

3.2.23 MM. Multiple mission aircraft (AFIS, SAFI, and logistics). Refers to one class of aircraft to which this specification applies.

3.2.24 MSL. Mean sea level

3.2.25 MSR. Medium size/medium range aircraft. Refers to one class of aircraft to which this specification applies.

3.2.26 MSU. Mode selector unit for the inertial system

3.2.27 MTBF. Mean time between failures

3.2.28 NBAA. National Business Aircraft Association

3.2.29 Passenger/Trainee Position. The passenger/trainee position refers to a non-crewmember seating location available for use by a flight inspection technician trainee, if onboard. The passenger position located nearest the flight inspection console shall be used for this purpose. It will not be necessary for the trainee to see the flight inspection instrumentation while seated.

3.2.30 Semi-Automatic Flight Inspection (SAFI). SAFI is a data acquisition and recording system used to evaluate performance of multiple VOR, TACAN, and DME ground based en route navigational aids. SAFI utilizes pre-programmed, grid type, flight plans to navigate the aircraft, and simultaneously collects and records data from a multitude of navigation sensors. The central processor for this system will be a modified AFIS NCU (AFIS/SAFI NCU).

3.2.31 SAT. Static air temperature

3.2.32 SELCAL. Selective calling system used in conjunction with HF Comm

3.2.33 Specification. Specification means this specification.

3.2.34 SSEC. Static source error correction

3.2.35 TAS. True airspeed

3.2.36 TAT. Total air temperature

3.2.37 TIEO. Technical Issuance Engineering Order

3.2.38 Vmo. Maximum operating airspeed

3.3 Aircraft Characteristics.

3.3.1 Performance. The aircraft performance requirements shall be based upon takeoff at a weight commensurate with full mission load and maximum range requirements and shall be computed based upon International Standard Atmospheric (ISA) plus 20°C (ISA + 20°C) conditions or as specified in FAR Part 25. For the purpose of this requirement, full mission load shall equal 1,500 lbs (MSR), 1,750 lbs (LSR), or 3,000 lbs (MM).

3.3.1.1 Start Capability. The aircraft, including the APU, shall have a proven, self start capability throughout the temperature range of -40°F to +120°F. When flown from a tropical climate (100°F or greater) to an arctic climate, the aircraft engines and

APU shall start after a temperature soak of at least 6.0 hours at a temperature of -40°F, without requiring any modifications.

3.3.1.2 Takeoff and Climb. The LSR and MM aircraft shall takeoff and direct climb to an altitude at which the requirement of 3.3.1.5.2 and 3.3.1.5.3 can be met without a step climb. The MSR aircraft shall take off and climb to an altitude at which the requirement of 3.3.1.5.1 can be met and a step climb is authorized. The certificated ceiling for the LSR and MSR aircraft shall not be less than 41,000 ft. MSL and the certificated ceiling for the MM aircraft shall not be less than 25,000 ft. MSL.

3.3.1.3 Low Altitude Performance. The aircraft shall be capable of performing a mission consisting of:

a. Start, taxi, takeoff, climb to 2,000 feet MSL at ISA + 20°C,

b. Three hours, minimum, of continuous flight operation at 2,000 feet MSL, at 240 ± 10 knots indicated airspeed (KIAS), and

c. Have enough fuel for an alternate airfield (assuming an alternate airfield to be 150 nautical miles) plus 45 minutes reserve at normal cruise. (FAR 91.167 requirements)

3.3.1.4 MLS Operations. The aircraft shall be capable of flying autopilot coupled, microwave landing system (MLS) approaches. Approaches shall be flown to runway threshold and shall consist of glidepath angles within the ranges listed below.

a. MSR and LSR aircraft: 1.0 degree to 3.5 degrees

b. MM aircraft: 1.0 degree to 6.5 degrees

3.3.1.5 Aircraft Range.

3.3.1.5.1 MSR Range. While in a fully loaded standard mission configuration, the MSR aircraft shall have endurance sufficient to:

a. Depart a 5,000 foot MSL airfield (ISA + 20°C),

b. Fly 500 nautical miles en route at optimum cruise altitude,

c. Fly for 3 hours, minimum, at 2,000 feet MSL, at 240 ± 10 KIAS, and

d. Have enough fuel for an alternate airfield (assuming an alternate airfield to be 150 nautical miles) plus 45

minutes reserve at normal cruise. (FAR 91.167 requirements)

3.3.1.5.2 LSR Range. The LSR aircraft shall be capable of flying 3,500 nautical miles to dry tanks at optimum cruise altitude and airspeed while in a fully loaded standard mission configuration.

3.3.1.5.3 MM Range. The MM aircraft shall be capable of flying 2,200 nautical miles to dry tanks at optimum cruise altitude and airspeed while in a fully loaded standard mission configuration.

3.3.1.6 Balanced Field Length. The minimum balanced field lengths shall be as follows:

a. MSR: 5,500 feet, gravel and hard surface

b. MM: 4,000 feet, gravel and hard surface

c. LSR: 5,500 feet, hard surface

Each aircraft shall have anti-skid braking and thrust/prop reverser systems installed.

3.3.2 Physical Characteristics.

3.3.2.1 Cockpit. The configuration and layout of all instruments, controls, switches, and indicators shall be arranged in a logical and efficient manner. MIL-STD-203F shall be used as a guide in the basic design of the cockpit (reference 6.1). The configuration and layout shall be identical for all quantities of each aircraft class.

3.3.2.1.1 Instrumentation and Control. A complete set of flight instruments and associated controls shall be installed at both pilot and copilot positions. All instruments and controls essential for safety of flight and mission accomplishment shall be clearly visible and accessible by pilot and copilot while seated and using body restraint devices. Instrument glass shall be nonreflective to subdue glare.

3.3.2.1.2 Clocks. Two clocks shall be provided: one for the pilot and one for the copilot. Each clock shall have a stopwatch capability.

3.3.2.1.3 Visibility. The cockpit shall be arranged to provide the pilots a sufficiently extensive, unobstructed, and undistorted air-to-ground and air-to-air view, while performing maneuvers associated with the flight inspection mission as specified in FAA Orders 4040.9, 8200.1, 8240.39A, 8240.45, 8240.50, and 8260.34.

3.3.2.1.4 Future Growth. A blank panel, conforming to MS25212 dimensions and mounting (DZUS type fasteners), shall be provided in the cockpit. The panel shall be 6.38 inches high (minimum), and shall have an unobstructed depth of 10 inches (minimum). The entire panel shall be located forward of the pilots' belt buckle and shall be visible and accessible by both pilots.

3.3.2.2 Cabin.

3.3.2.2.1 Cabin Size. Cabin size requirements are defined in terms of two measurable values: average cabin width and cabin area. Average cabin width is defined as the average of two measurements: the maximum cabin width and the width at floor level. Both measurements shall be taken at the cabin fore/aft midpoint. Cabin area is defined as the product of the average cabin width and the cabin length. Cabin length is measured from the rear surface of the cockpit/cabin divider to the aft pressure bulkhead. Minimum width and area requirements shall be as stated below.

a. MSR Cabin Size:

Average Cabin Width	4.8 ft
Cabin Area	85 ft^2

b. LSR Cabin Size:

Average Cabin Width	6.4 ft
Cabin Area	200 ft^2

c. MM Cabin Size:

Average Cabin Width	7.0 ft
Cabin Area	220 ft^2

3.3.2.2.2 Flight Inspection Work Area - Common Requirements.

3.3.2.2.2.1 Operational Accessibility. Each component of the flight inspection system which requires in-flight adjustment, monitoring, or operation shall be installed readily accessible and viewable by the flight inspection technician while seated at his operational position.

3.3.2.2.2.2 Maintainability. All equipment installed in the flight inspection console or flight inspection equipment rack shall be readily accessible by means of removable covers, panels, or access doors which are easily removed or opened by quick disconnect quarter turn fasteners or equivalent methods. This requirement also applies to the space identified for future expansion.

3.3.2.2.2.3 Calibration Access Requirements. During ramp calibration of the AFIS equipment, it is necessary to connect a general

purpose interface bus (GPIB) cable between the AFIS NCU test receptacle and carry-on test equipment. The test receptacle is located at the rear of the AFIS NCU, above the main disconnects, and during normal operation, is disconnected. The AFIS NCU shall be installed such that a technician can gain access to the rear of the AFIS NCU and connect a GPIB cable in less than 90 seconds, unaided by a flashlight.

3.3.2.2.2.4 Work Area Lighting. Floodlighting shall be installed in the cabin overhead to provide illumination surrounding the flight inspection technician's work area. The floodlighting shall have a light intensity control readily accessible to the flight inspection technician. Independent floodlighting shall be installed in the cabin overhead to provide illumination of the equipment installed in the flight inspection equipment rack. Provisions (such as curtains or partition) shall be installed to keep flight inspection work area lighting from interfering with cockpit night-time operations.

3.3.2.2.3 Flight Inspection Work Area - AFIS (MSR and LSR). The flight inspection console and flight inspection equipment rack shall be installed so that each can be removed from the aircraft by two people in four hours or less.

3.3.2.2.3.1 Flight Inspection Equipment Rack (MSR and LSR). The flight inspection equipment rack shall be located in the cabin area. Although the primary function of the rack is to house flight inspection equipment, the contractor shall be permitted to install certain non-flight inspection equipment in the rack at his option (see table IA). Due to possible limitations in size of the flight inspection console, installation of some of the instrumentation type equipment (oscilloscope, spectrum analyzer, etc.) in the flight inspection equipment rack will be permitted. Accessibility requirements shall still apply.

a. All wiring shall enter the rack via "MS" circular electrical disconnects. Coaxial cables shall also include rack disconnects. A minimum of 50 square inches (approximately 7" x 7") of unused space shall be available for additional electrical disconnects.

b. A stowable work surface (i.e. on hinges or slides), 8 inches by 14 inches minimum, shall be installed directly below the printer/plotter. If the printer/plotter is installed in the flight inspection console, this requirement shall apply to the flight inspection console.

c. The flight inspection equipment rack shall have adequate unused space to install up to eight additional line replaceable units (LRU), each LRU having a size of four modular concept units (MCU). The space shall be arranged

such that at least four LRU's can be installed side by side.

d. Any circuit breaker panels installed in the rack shall have holes and sufficient unobstructed space to accommodate at least 10 additional circuit breakers.

3.3.2.2.3.2 Console (MSR and LSR). The flight inspection console is the flight inspection technician's workstation and shall contain the AFIS display and keyboard.

a. The flight inspection console shall be oriented such that the technician will be facing forward (front of aircraft) while viewing the display/keyboard.

b. All wiring shall enter the console via "MS" circular electrical disconnects. Coaxial cables shall also include rack disconnects. A minimum of 25 square inches (approximately 5" x 5") of unused space shall be available for additional electrical disconnects.

c. A work surface shall be installed adjacent to the keyboard for use by the flight inspection technician. In the MSR aircraft, the work surface shall be 10 inches by 14 inches, minimum; in the LSR aircraft, the work surface shall be 12 inches by 20 inches, minimum.

d. A blank panel, conforming to MS25212 dimensions and mounting (DZUS type fasteners), shall be provided in the console for future expansion. The panel shall be 9.00 inches high (minimum), and shall have an unobstructed depth of 10 inches (minimum).

e. Any circuit breaker panels installed in the rack shall have holes and sufficient unobstructed space to accommodate at least six additional circuit breakers.

3.3.2.2.3.3 Equipment Locations (MSR and LSR). Table IA lists the various equipment which shall be installed in the flight inspection console and the flight inspection equipment rack. Note that some equipment may be installed in either structure at contractor's option. All equipment containing controls or indicators shall be installed in such a manner as to be readable and accessible by the flight inspection technician without unnecessary movement or motion. The location of the display/keyboard, the printer/plotter, the oscilloscope, and the spectrum analyzer shall be such that the technician's seat can be rotated to face the front of each.

3.3.2.2.4 Flight Inspection Work Area - AFIS/SAFI (MM). The flight inspection console, flight inspection equipment rack, and

spectrum analyzer rack shall be installed so that all can be removed from the aircraft by two people in four hours or less.

3.3.2.2.4.1 Flight Inspection Equipment Rack (MM). The flight inspection equipment rack shall be located in the cabin area. The function of the rack is to house flight inspection equipment unique to SAFI. Reference table IB and figure 11.

a. All wiring shall enter the rack via "MS" circular electrical disconnects. Coaxial cables shall also include rack disconnects. A minimum of 50 square inches (approximately 7" x 7") of unused space shall be available for adding additional electrical disconnects.

b. The flight inspection equipment rack shall have adequate unused space to install up to four additional LRUs, each LRU having a size of four modular concept units (MCU). The space shall be arranged such that at least two LRU's can be installed side by side.

c. Any circuit breaker panels installed in the rack shall have holes and sufficient unobstructed space to accommodate at least six additional circuit breakers.

3.3.2.2.4.2 Console (MM). The flight inspection console shall act as the flight inspection technicians' workstation, containing two displays and two keyboards to accomodate the two flight inspection technicians. Reference figure 10.

a. The flight inspection console shall be oriented such that the two technicians will sit side by side, facing forward, while viewing the display/keyboards. Sufficient space shall exist for each technician to get up and leave his seat, return, and be seated without disturbing the other.

b. During AFIS operation, the AFIS/SAFI NCU will deactivate one display and its corresponding keyboard.

c. One printer/plotter shall be installed in the console between the two displays. It shall be used for both SAFI and AFIS operations.

d. All wiring shall enter the console via "MS" circular electrical disconnects. Coaxial cables shall also include rack disconnects. A minimum of 25 square inches (approximately 5" x 5") of unused space shall be available for adding additional electrical disconnects.

e. A work surface, 14" D x 24" W minimum, shall be located between the two keyboards for use by the flight inspection technicians.

263

f. Two blank panels, conforming to MS25212 dimensions and mounting (DZUS type fasteners), shall be provided in the console for future expansion. One panel shall be 6.00 inches high (minimum) and the second panel shall be 4.50 inches high (minimum). Each shall have an unobstructed depth of 10 inches (minimum).

g. Any circuit breaker panels installed in the rack shall have holes and sufficient unobstructed space to accommodate at least six additional circuit breakers.

3.3.2.2.4.3 Spectrum Analyzer Rack (MM). The spectrum analyzer rack shall be located directly behind the two flight inspection technicians.

a. The spectrum analyzer and one printer/plotter shall be installed in the rack and shall face the backs of the two technicians.

b. During AFIS operation, the printer/plotter installed in the spectrum analyzer rack will become inactive.

c. All wiring shall enter the rack via "MS" circular electrical disconnects. Coaxial cables shall also include rack disconnects. A minimum of 25 square inches (approximately 5" x 5") of unused space shall be available for adding additional electrical disconnects.

d. A blank panel, conforming to MS25212 dimensions and mounting (DZUS type fasteners), shall be provided in the rack for future expansion. The panel shall be 4.50 inches high (minimum), and shall have an unobstructed depth of 10 inches (minimum).

3.3.2.2.4.4 Equipment Locations (MM). Table IB lists the various equipment which shall be installed in the flight inspection console, the flight inspection equipment rack, and the spectrum analyzer rack. All equipment containing controls or indicators shall be installed in such a manner as to be readable and accessible by the flight inspection technician(s) without unnecessary movement or motion. The location of the technician's display/keyboard, both printer/plotters, the oscilloscope, and the spectrum analyzer shall be such that each technician's seat can be rotated to face the front of each.

3.3.2.2.4.5 Non-Flight Inspection Mission Capability (MM). The configuration of the cabin shall be such that with the flight inspection rack and spectrum analyzer rack removed, additional passenger seats can be readily installed on existing seat rails or other approved seat attachments in the configuration for which the aircraft was originally certificated.

3.3.2.2.5 Non-Flight Inspection Equipment Racks. Equipment racks installed in the cabin, which are in addition to those required for flight inspection, shall meet the following requirements.

a. At least one non-flight inspection equipment rack shall be installed in the MM aircraft.

b. In the MM aircraft, one non-flight inspection equipment rack shall have adequate unused space to install up to four additional LRU's, each LRU having a size of four MCU's. The space shall be arranged such that all four LRU's can be installed side by side.

c. Any circuit breaker panels installed in the rack shall have holes and sufficient unobstructed space to accommodate at least six additional circuit breakers.

3.3.2.2.6 Passenger Provisions.

3.3.2.2.6.1 Passenger Information Signs. The aircraft shall be equipped with passenger information signs as specified in FAR 25.791.

3.3.2.2.6.2 Reading Lights. Each passenger position shall have an overhead floodlight installed. Each floodlight shall have its own on-off switch. This requirement shall not apply to passenger positions identified in 3.3.2.2.4.5 and 3.3.2.2.8 (MM cargo area).

3.3.2.2.7 On Board Storage.

3.3.2.2.7.1 Baggage Compartment. The aircraft shall have a single storage area of at least 35 cubic feet with restraints to prevent shifting of baggage. The capacity of the area shall be at least 300 pounds, of which 150 pounds must be accessible in flight. The aircraft shall have interior lighting installed in all baggage compartments with a switch adjacent to the compartment opening. The lights shall be sufficient to illuminate the entire compartment and shall automatically extinguish after 10 minutes of continuous operation.

3.3.2.2.7.2 Rigid Container. A rigid container, having a capacity of at least 10 cubic feet and having approximate dimensions of 2 feet by 5 feet by 1 foot high (MSR) or 15 cubic feet and having approximate dimensions of 3 feet by 5 feet by 1 foot high (LSR and MM), shall be installed in the cabin. The container shall be easily removable, fitted with a lid and having handles for lifting. Adequate provisions shall be made to restrain the container when it contains a maximum of 250 pounds.

3.3.2.2.8 Cargo Floor (MM). The cabin shall have a cargo floor which will withstand a load of 300 pounds per running foot. The

cargo area shall be large enough to haul a 1,200 lb, 4 foot by 5 foot by 10 foot crate with the spectrum analyzer rack, flight inspection console, and all equipment racks installed. Throughout the cargo area, the floor shall contain seat rails and tie-down rails and shall be capable of carrying cargo, passengers, and combinations of both.

3.3.2.3 Furnishing and Interior Trim. The contractor shall furnish the aircraft with color coordinated interior and furnishings. In addition, the contractor shall supply at least the following furnishings.

3.3.2.3.1 Seats. The MSR and LSR aircraft shall provide for a crew of four: pilot, copilot, observer, and one flight inspection technician. The MM aircraft shall provide for a crew of five: pilot, copilot, observer, and two flight inspection technicians. In addition, MSR and MM aircraft shall be equipped for a minimum of two passengers; LSR aircraft shall be equipped for a minimum of three passengers. See additional seating requirements for MM aircraft in 3.3.2.2.4.5 and 3.3.2.2.8.

3.3.2.3.1.1 Crewmember Seats. Seats for the pilot, copilot, and flight inspection technician(s) shall be track-mounted with fore and aft travel and shall have vertical adjustments. The seats shall have retractable arms, adjustable backs, and adjustable lumbar support. The flight inspection seat(s) shall be capable of rotating 360 degrees.

3.3.2.3.1.2 Crewmember Restraint System. Each crewmember position shall have a rotary buckle restraint system installed which includes a lap strap, crotch strap, and shoulder harness with inertial reel. The rotary buckle shall be attached to the lap strap. The crotch strap and lap strap shall be adjustable for crew comfort. The restraint system shall be adjustable so that there is no pull pressure exerted on the crewmember's body while normally sitting in the seat. The restraint system shall allow crewmember access to all required equipment, without unbuckling, during flight.

3.3.2.3.1.3 Observer Position Seat. The observer position shall have a seat, certificated for takeoff and landing, located immediately aft of the pilot and copilot positions to permit the occupant ready in-flight observation of the cockpit instrument panel area. This seat shall not obstruct ingress or egress to the cockpit when not in use.

3.3.2.3.1.4 Flotation Devices. Flight crew and passenger seats shall have provisions for an approved flotation device meeting requirements of TSO C72b.

3.3.2.3.2 Interior Trim. The contractor shall provide a commercially available interior compatible with the exterior paint scheme. Upholstery and interior trim shall not deteriorate prematurely under normal use at the temperature extremes specified in 3.3.5.1. Carpeting shall be of the most durable and tightly woven type available so as to ensure minimal shedding of lint.

3.3.2.3.3 Drink Cup Holders. The aircraft shall have drink cup holders installed at all crew positions.

3.3.2.3.4 Galley. The aircraft shall have a galley installed with insulated container accommodations for storage of hot and cold foods, beverages, and ice. The LSR and MM galleys shall have provisions for heating liquids and meals.

3.3.2.3.5 Lavatory. The aircraft shall be provided with a chemical flushing toilet which is enclosed or curtained for privacy. The toilet shall have a cushioned cover. The toilet need not be certificated for occupancy during takeoff and landing. If the seat is so certificated, it shall not be counted as one of the required passenger and/or observer positions specified in 3.3.2.3.1 In the LSR and MM aircraft, the lavatory shall contain a sink and faucet with cold running water. The toilet and sink drainage (LSR and MM) shall be serviceable from the aircraft exterior.

3.3.2.3.6 Safe. Space shall be provided to accommodate a safe (one drawer, 1½ ft^3 minimum capacity).

3.3.2.4 Doors. If the design of the aircraft is such that entry or egress requires external provisions, the aircraft shall have an air stair door and handrail installed. The door shall be counterbalanced for easy and safe operation. The air stair door shall be capable of operation from inside and outside the aircraft.

3.3.2.4.1 Door Locks. Door locks for all external doors shall be installed on the aircraft. Means of preventing aircraft entry through emergency exits, while the aircraft is parked, shall be installed. All locks, within each class of aircraft, shall be keyed the same.

3.3.2.4.2 Air Stair Lighting. If the air stair door is furnished, it shall be furnished with lighting for stair safety.

3.3.2.4.3 Cargo Door (MM). The aircraft shall have a hinged cargo door or rear ramp which provides access into the main cabin. The cargo door opening shall be a minimum of 5 feet high by 10 feet long and shall be located to allow the loading and unloading of various equipment. The door shall be contoured to the aircraft and shall have a fail-safe structure. The ramp shall have a minimum opening of 5 feet high by 6 feet wide.

3.3.2.5 External Lighting. The following lighting requirements are in addition to those essential for FAA certification.

3.3.2.5.1 Logo Lights. The aircraft shall have tail illumination logo lights installed.

3.3.2.5.2 Strobe Lights. The aircraft shall have high intensity strobes, an anti-collision light system which meets the requirements of FAR 25.1401, and red rotating beacons with independent switching for on and off selection.

3.3.2.5.3 Recognition Lights. In addition to the landing lights, the aircraft shall have a flush mounted, forward facing, recognition light.

3.3.2.5.4 Pulse Lights. The aircraft shall have a manually activitated pulse light system utilizing the existing landing and wing tip recognition lights. Each system shall be independently operated. The pulse system shall be pulsed between 100 percent and 30 percent intensity at a rate of approximately 45 cycles per minute. Compliance with FAA Advisory Circular AC 20-30B is required.

3.3.2.6 Exterior Finish and Markings. The contractor shall paint the exterior of the aircraft in a design similar to that shown in FAA drawing 4110120, Revision 4, dated March 6, 1991.

3.3.3 Human Performance/Human Engineering. The physical layout of the flight inspection system, the cabin, and the cockpit shall be designed using MIL-STD-1472D as a guide (reference 6.1), with the exception of paragraphs 5.10, 5.11, and 5.12. The performance of any task required for the operation or maintenance of the flight inspection system, avionic systems, and aircraft systems shall accommodate the 5th through 95th percentile FAA crew members specified as "aviators" in MIL-STD-1472D who have been appropriately selected and trained.

3.3.4 Noise Levels. The noise level in both the cockpit and the cabin shall not exceed the sound pressure levels (SPL) shown in figure 3 of MIL-S-8806B. An ambient noise level of 85 dB SPL shall not be exceeded during any flight condition. This includes noise from operational landing lights at speeds up to 250 KIAS. Aural cockpit alarms shall be between 5 dB and 10 dB above ambient.

3.3.5 Environmental Requirements.

3.3.5.1 Operational Temperature Range. The aircraft and all installed equipment shall function properly under all flight conditions in atmospheric ambient temperatures ranging from -65°F to +125°F.

3.3.5.2 Cooling and Heating.

3.3.5.2.1 Ground Cooling and Heating Performance. Cockpit and cabin temperatures shall be maintainable within ±5°F of any flight crew selected temperature within the range of +65°F and +85°F.

a. The cooling system shall reduce temperatures in the cockpit and cabin areas at a rate of 1°F per minute when the aircraft has been heat-soaked for 6 hours at a maximum ambient temperature of +120°F. This temperature reduction must be accomplished with the flight inspection system electrical and electronics equipment in operation.

b. The heating system shall heat the cockpit and cabin areas at a rate of 2°F per minute when the aircraft has been cold-soaked for 6 hours at an ambient temperature of -40°F.

c. Ground cooling and heating requirements apply to APU operation and engine powered operation.

3.3.5.2.2 In-flight Cooling and Heating Performance. Cockpit and cabin temperatures shall be maintainable within ±5°F of any flight crew selected temperature within the range of +65°F and +85°F under the following conditions.

a. Aircraft operations shall occur at altitudes between ground level and maximum certificated altitude and at speeds of 150 KIAS and greater. All air conditioners and heaters shall be certified for operation to the maximum certificated altitude of the aircraft.

b. Aircraft will operate with outside air temperatures ranging from -65°F to +125°F

3.3.5.2.3 EFIS Display Unit Environment. The Electronic Flight Instrumentation System (EFIS) display units' surrounding air temperature shall be maintained between 0°F and 100°F during ground and airborne operation.

3.3.5.2.4 Flight Inspection Equipment Rack Environment. Temperature control for the flight inspection equipment rack shall be provided to maintain a controlled environment.

3.3.5.2.4.1 Performance. During ground power cart operation, the ambient temperature within the rack shall not exceed the ambient cabin temperature by more than 20°F. During APU and engine operation, the stabilized ambient temperature within the flight inspection equipment rack shall be 75 ± 5°F. The system shall change the temperature within the rack at a minimum rate of 2°F per minute until it reaches a nominal temperature of 75°F. The heating and

cooling system shall meet all of these same requirements with an additional load of 450 watts of power dissipation within the rack to accommodate future expansion.

3.3.5.2.4.2 Warning Annunciator. A warning annunciator, installed in the cockpit annunciator panel, shall illuminate if the ambient temperature within the flight inspection equipment rack exceeds 85°F and shall also illuminate whenever the temperature control cooling system malfunctions.

3.3.5.2.5 Flight Inspection Console Environment. During power cart, APU, and engine operation, the ambient temperature within the flight inspection console shall not exceed the ambient cabin temperature by more than 20°F.

3.3.5.2.6 Condensation. The air conditioning system, components, and lines shall be insulated to prevent condensation.

3.3.5.2.7 Ice or Fog on Cockpit Windows. There shall be no ice or fog present on inside of cockpit windows while operating between -65°F and +125°F. The presence of small amounts of ice or fog in window corners during altitude changes shall be considered acceptable.

3.3.5.3 Emissions. The aircraft shall comply with current Environmental Protection Agency (EPA) aircraft engine pollution standards as specified in the Code of Federal Regulation, Title 40, Part 87.

3.3.5.4 Toxicity. Personnel exposure to toxic air contaminants during operation or maintenance shall not exceed the 8 hour time weighted average and ceiling values of CFR Title 29, OSHA Standard 1910.1000, (a) (2) and (b) (1) and (2).

3.3.6 Systems.

3.3.6.1 Propulsion.

3.3.6.1.1 Engines. The LSR aircraft shall have turbofan engines. The MSR and MM aircraft shall have turbine powered engines.

3.3.6.1.2 Engine Service Life. When operated and maintained in accordance with approved FAA operating and maintenance procedures, the engine service life, based on the mission profiles provided in 1.3, shall be at least 5,000 flight-hours.

3.3.6.1.3 Performance. The propulsion system installation, including inlet, bleed and power extraction, shall be such that the engines shall not stall, flame out, or experience unsatisfactory operation including rollbacks to flight idle throughout the operating envelope.

3.3.6.1.4 Engine RPM Synchronization System. The aircraft and engines shall be equipped with an automatic engine RPM synchronization system.

3.3.6.2 Engine Performance Trend Monitoring/Structural Integrity System. The aircraft shall have an on board Engine Performance Trend Monitoring (EPTM)/Structural Integrity recording system installed. TIEO 89-E-6 provides a model of the required system.

3.3.6.3 Time-in-Service Meter. The aircraft shall be equipped with a meter, actuated by a landing gear squat switch, which shall record time in service.

3.3.6.4 Fuel System.

3.3.6.4.1 Fueling. The aircraft shall have both a single point pressure fueling system and an over-the-wing fueling system. The single point fueling system shall be installed with all controls and valves accessible from the ground for complete servicing of the aircraft.

3.3.6.4.2 Fuel Flow Meters. The aircraft shall have fuel flow meters which display mass rate of flow and total fuel remaining. These meters are in addition to the fuel quantity indicators required by FAA certification regulations.

3.3.6.5 Auxiliary Power Unit (APU). The aircraft shall have an APU installed which meets the requirements listed below. Airborne APU operation shall not be required. If the aircraft is a turboprop type, an engine with propeller brake shall be considered an acceptable alternative to an APU if (a) it meets all the APU requirements contained herein and (b) no perceivable amount of engine exhaust accumulates in the aircraft cabin/cockpit with all doors open and emergency hatches removed.

3.3.6.5.1 Electrical Power.

3.3.6.5.1.1 Regulation. The APU shall provide electrical power in accordance with 3.3.7.1.

3.3.6.5.1.2 Loading. Sufficient electrical power shall be supplied to meet all electrical on-ground requirements, including battery charging, air conditioning and heating (both cockpit/cabin and flight inspection rack), and operation of all avionics and flight inspection systems, for indefinite periods of time.

3.3.6.5.1.3 Engine Start. The APU, in conjunction with the aircraft battery, shall provide sufficient power to start the aircraft engines in all weather conditions between the temperatures of -40°F and +120°F.

3.3.6.5.2 Starting Temperatures. The APU shall have self-starting capabilities at all temperatures between -40°F and +120°F.

3.3.6.5.3 Pneumatic Requirements. In addition to providing the required electrical power, the APU shall simultaneously provide sufficient air to operate all pneumatic operated controls and devices, including air cycle type air conditioners, and have a 20 percent power reserve for future growth.

3.3.6.6 Oxygen System. The aircraft shall have installed supplemental oxygen equipment meeting the requirements of FAR 25.1441 through FAR 25.1453. The supplemental oxygen system shall be approved for operation at the aircraft's maximum certificated altitude. Additional requirements are listed below.

a. The aircraft shall have sufficient supplemental oxygen capacity and shall supply the entire seating capacity, to reach the destination airport from the midpoint (in time) of a 2,200 nautical mile leg (MSR and MM) or a 3,500 nautical mile leg (LSR) in the event of a cabin pressurization failure in which cabin pressure altitude is the same as aircraft pressure altitude.

b. The oxygen masks provided shall be quick donning type and contain microphones and pressure demand regulators with automatic dilute features for the pilot, copilot, observer, and flight inspection technician(s). Masks shall meet TSO C-78 and TSO C-89 and shall be of the same part number for all crew positions. Smoke masks shall be provided at all crew positions. The smoke mask/oxygen mask combination, when mated together, shall meet TSO C-99.

c. Individual dropout oxygen dispensing units shall be provided at each passenger position. This shall include passenger positions identified in 3.3.2.2.4.5 and 3.3.2.2.8.

d. The supplemental oxygen system shall have external fill provisions.

e. Two portable oxygen cylinders shall be furnished. Each shall have an 11 cubic foot capacity and shall be equipped with a mask. One shall be located in a position which is readily accessible from the copilot's seat. The second shall be located and accessible from the flight inspection technician position.

3.3.7 Electrical System.

3.3.7.1 Electrical Power Requirements. The aircraft electrical power system shall provide 28 ± 2 VDC and regulated 115 ± 5 VAC, 400 ± 20 Hz. All wiring, electrical systems, and equipment shall be installed and function in accordance with the applicable certification requirements. All electrical power shall comply with MIL-STD-704D.

3.3.7.2 External Power Capability. The aircraft shall have provisions for connecting external power to the aircraft. The external power shall be electrically connected to all aircraft and flight inspection systems simultaneously and shall have battery charging capability. Over and under voltage, reverse polarity, and phasing protection from external power shall be installed within the aircraft. Over voltage protection for DC power shall be 33 ± 1 volts. Over voltage protection for AC power shall be 125 ± 5 volts. Under voltage protection for AC power shall be 100 ± 5 volts. Using external power, the aircraft shall be capable of engine start in accordance with 3.3.1.1.

3.3.7.3 Generators/Alternators. The aircraft engine generators and/or alternators shall be of sufficient capacity to supply, when operating at 75 percent of rated capacity, all combinations of continuous electrical loads. With one engine inoperative, the remaining power sources shall be capable of supplying sufficient power to that equipment required for continued flight, navigation, and communication. If DC to AC inverters are used, they must be of solid state construction and capable of synchronization.

3.3.7.4 Battery. The aircraft battery shall be a nickel cadmium, 20 cell type. The battery shall be air cooled. A battery temperature sensing system, with cockpit indicator, and an over-temperature warning system shall be installed. Design of the battery compartment shall prevent entrance and accumulation of water in the battery or its containment compartment.

3.3.7.5 Load Shedding. The aircraft shall have a load shedding capability installed that automatically disconnects the AC and DC flight inspection mission busses in the event of a single generator failure. Additional shedding capability shall be provided if the load meter exceeds 80 percent on the remaining generator. The aircraft shall have provisions for automatic shedding of all equipment not essential to emergency aircraft operation in the event of dual generator failure. All load shedding capabilities shall comply with FAR 25.1351(d) and FAR 25.1355(c).

3.3.7.6 Flight Inspection Mission Power Switch. A switch shall be installed in the pilot area of the cockpit which shall apply power to dedicated flight inspection equipment. The MM aircraft shall have a second mission power switch located in the flight inspection console as indicated in figure 9. Flight inspection equipment powered with this switch are listed below:

a. Both AFIS VOR/ILS receivers

b. Oscilloscope

c. Spectrum analyzer

d. AFIS printer/plotter

e. AFIS display/keyboard terminal

f. AFIS Loran-C receiver

g. AFIS marker beacon receiver

h. AFIS data loader

i. All equipment residing in the flight inspection equipment rack (MM)

j. SAFI printer/plotter (MM)

k. SAFI display/keyboard terminal (MM)

l. SAFI data loader/recorder (MM)

3.3.7.7 SAFI Power Switch (MM). A switch shall be installed, in view and reach of the AFIS flight inspection technician while seated, which shall apply power to the SAFI VOR and TACAN receivers located within the flight inspection equipment rack. This switch shall not affect power to the SAFI Audio/Oscilloscope Waveform Multiplexer unit (reference figure 9).

3.3.7.8 Growth Capacity. There shall be adequate power available in each rack and in the flight inspection console for future growth. The minimum power reserves shall meet the values listed in Table II. Electrical wiring, switches, relays, and circuit breakers feeding the racks shall be adequate to support these reserves.

3.3.7.9 60 Hz Power. A 115 volt, 60 Hz, 250 VA inverter, Avionic Instruments model 2A-250-1B, or equivalent, shall be installed for the flight inspection technician(s) use (see 3.3.7.10).

3.3.7.10 Convenience Outlets. Two duplex NEMA receptacles shall be provided at the flight inspection equipment rack, each accessible from the aisle. One receptacle shall provide 115 volt, 400 Hz power at 5 amperes. The second receptacle shall provide 115 volt, 60 Hz power at 2 amperes (see 3.3.7.9). Each receptacle shall be clearly identified as to voltage, frequency, and current rating.

3.3.8 Instrument, Indicator, and Control Unit Lighting.

3.3.8.1 Instrument and Control Unit Lighting. Instrument lighting and control unit lighting shall have variable dimming capability. Independent dimming controls shall be provided for the pilot's instrument panel, the center instrument panel, the copilot's instrument panel, the overhead, the center and side pedestals, and the flight inspection console.

3.3.8.2 Lighting for Standby Instruments. Standby instruments shall have provisions for continued lighting in the event of power loss. The standby lighting system shall utilize an automatically rechargeable battery which shall not discharge inadvertently due to normal shutdown of aircraft power. The rechargeable battery shall be capable of lighting the standby instruments for a minimum of 20 minutes with power removed and shall alert the pilots when low battery condition exists. The standby instruments include standby magnetic compass, standby attitude indicator, standby altimeter, and standby airspeed indicator.

3.3.8.3 Annunciator Lamp Test. All annunciators in the cockpit and at the flight inspection console shall have lamp test capability. One momentary action switch shall be located in the instrument panel in easy reach of both pilots, shall test all cockpit annunciators, and shall not affect the flight inspection console annunciators. One momentary action switch shall be located at the flight inspection console, shall test all flight inspection console annunciators, and shall not affect cockpit annunciators.

3.3.8.4 Annunciator Dimming. All annunciators in the cockpit and at the flight inspection station shall have dimming capability. Dimming operation shall be independent between the cockpit and the flight inspection console. Each dimming system shall meet the requirements listed below:

a. All annunciators shall be legible under any day and/or night lighting operation.

b. Annunciators shall be capable of being dimmed to the point where objectionable brightness can be avoided during nighttime flight.

c. Annunciators shall not be capable of being dimmed to the point where a lit annunciator can be interpreted as being unlit.

3.3.9 Emergency Equipment.

3.3.9.1 Cockpit Voice Recorder. A cockpit voice recorder certified to TSO C84 or TSO C123 shall be installed. The installation shall comply with the requirements of FAR 121.359.

3.3.9.2 Flight Data Recorder. A digital flight data recorder certified to TSO C51a or TSO C124 and meeting the requirements of ARINC 573 or ARINC 717 shall be installed. The installation shall comply with the requirements of FAR 121.343.

3.3.9.3 Emergency Locator Transmitter (ELT). An ELT meeting TSO C91a shall be installed. The ELT shall be installed in the aircraft in such a manner that the probability of damage to the transmitter, in the event of crash impact, is minimized. The ELT shall be installed as far aft as is practical in a location accessible for removal by the crew for portable use.

3.3.9.4 Fire Extinguishers. The cockpit shall have installed one Halon type hand fire extinguisher. The cabin shall have installed a minimum of one Halon type hand fire extinguisher of 2.5 lb capacity, accessible to the flight inspection technician(s). The type of fire extinguishers and the installation shall comply with AC 20-42C.

3.3.9.5 Overwater Provisions. The aircraft shall be furnished with emergency equipment meeting the requirements of FAR 121.339 for extended overwater operations.

3.4 Avionics.

3.4.1 General Requirements.

3.4.1.1 Equipment Characteristics and Performance. All equipment not specified by the Government as to brand name and type shall meet the following requirements.

3.4.1.1.1 Certification. Each item of equipment shall be certificated under its applicable TSO, if any, and shall meet FAR Part 21, "Certification Procedures for Products and Parts."

3.4.1.1.2 Reliability. Each item of equipment shall have an MTBF of 2,000 hours or greater.

3.4.1.1.3 Data Transfer Standard. The transferring of digital data among avionic systems shall conform to ARINC 429 standards to the maximum extent possible. For any avionics component within a system which internally transfers data in a non-ARINC 429 method, the contractor shall provide all documentation, software, software documentation, and technical data necessary to maintain, repair, and overhaul, and the contractor shall interface that component with other components within that system.

3.4.1.1.4 Built-in Test (BIT) Requirements. Each item of equipment shall have BIT and fault isolation capabilities if such are available.

3.4.1.2 Antenna Requirements. Flight inspection requirements dictate that specific antennas be used and that signal losses not exceed certain limits. In addition, specific RF signals are required for analysis and interference detection. Reference figure 5, "Antenna Systems Diagram."

a. All antennas shall be installed so as to provide optimum radiation patterns. Radiation patterns shall provide a relatively constant gain throughout the coverage area rather than having lobes and nulls.

b. Antennas shall be mated directly to the airframe or to a metallic doubler. The airframe mating surface shall be treated with a corrosion resistant, high conductivity coating such as Alodine 1001.

c. All coaxial cables shall use crimp type coaxial connectors.

d. Coaxial connectors shall be identified by function and plug number at all bulkhead and termination points.

3.4.2 Attitude, Altitude, and Compass Systems

3.4.2.1 Compass Systems. Dual compass systems shall be installed, each having an accuracy of ±2 degrees. An inertial reference system (IRS) which provides synthesized magnetic heading, meeting the accuracy requirement, shall be acceptable as a suitable equivalent.

3.4.2.2 Standby Magnetic Compass. A standby compass, certified per TSO C7c/d, shall be installed in full view of both pilots. The compass shall be the vertical card type.

3.4.2.3 Attitude Sensors. A minimum of three attitude sources shall be installed in the avionics system. Two approved attitude sources plus one standby attitude source shall be the minimum. Reference figures 2a, 2b, and 2c.

3.4.2.3.1 Inertial Reference System(s). The three inertial reference units (IRU) shall be attitude sources for the LSR aircraft. The single IRU and an approved second attitude source, such as a vertical gyro, shall be used for the MSR and MM aircraft.

3.4.2.3.2 Standby Attitude Indicator. A standby attitude indicator shall be installed in all aircraft on the pilot's instrument panel in accordance with FAR 121.305(j). The indicator shall be Jet Electronic Technology (J.E.T.) model AI-804(U), P/N 501-1197. The power supply shall be a J.E.T. model PS-835(D), P/N 501-1228.

3.4.2.4 Air Data Systems. Two identical air data computer (ADC) systems shall be installed. One system shall be connected to the pilot's pitot/static system and shall drive the pilot's instruments. The other system shall be connected to the copilot's pitot/static system and shall drive the copilot's instruments. Both ADC systems shall correct all data derived from static pressure measurement for static source error (SSE). A primary flight display (PFD) shall be acceptable to display the following indicators.

3.4.2.4.1 Altitude Indicators. Pilot and copilot instrument panels shall each have an altitude indicator installed. The indicator shall be of the counter-drum-pointer configuration with a means to apply barometric pressure corrections in both inches of mercury and millibars.

3.4.2.4.2 Airspeed Indicators. Pilot and copilot instrument panels shall each have an airspeed indicator (or airspeed/mach indicator). The indicator shall contain an internal reference bug.

3.4.2.4.3 Vertical Speed Indicators. Pilot and copilot instrument panels shall each have an instantaneous vertical speed indicator (IVSI). Reference 3.4.8.3b.

3.4.2.4.4 True Airspeed Indicator. A single true airspeed (TAS)/static air temperature (SAT) indicator, connected to display data from either air data system, shall be installed on the instrument panel.

3.4.2.4.5 Air Data System Performance. Each ADC system shall provide the functions and meet the tolerances listed in table III.

3.4.2.5 Altitude Alerting System. An altitude alerting system, meeting the requirements of FAR 91.219, shall be installed and connected to the pilot's air data system.

3.4.2.6 Standby Altimeter and Airspeed Indicators. A standby barometric altimeter, certified per TSO C10b, and a standby pneumatic airspeed indicator, certified per TSO C2c or TSO C46a, shall be installed on the instrument panel in a location visible to both pilots from a normal seated position.

3.4.2.7 Radio Altimeter (Shared with AFIS). A single radio altimeter system shall be installed. The altimeter shall be a Bendix model ALA-52A, P/N 204-1166-(*). Dual antennas, Sensor Systems P/N S67-2002-18 or equal, shall be installed. A single radio altimeter indicator, with analog type display (clock type hand and dial), shall be installed on the instrument panel. The radio altimeter data shall be integrated and displayed on both EFIS systems.

3.4.3 Radio Navigation.

3.4.3.1 Certification. All navigation systems specified below shall be certified as primary navigation equipment with no restrictions.

3.4.3.2 Frequency Control Units. Frequency control units for NAV/DME and ADF shall have the capability for presetting any frequency and then initiating tuning by means of a transfer switch. The operating frequency and the preset frequency shall both be displayed. These control units shall be miniaturized. Each NAV/DME control unit shall have a momentary push-button switch which shall provide the necessary discrete logic for activating the test mode within the NAV receiver and its corresponding DME.

3.4.3.3 Cockpit Radio Magnetic Indicators (RMI). Dual RMI's shall be installed in the instrument panel and shall display the following information.

a. Pilot's Single Bar Pointer: VOR-1 or ADF, as selected

b. Pilot's Double Bar Pointer: VOR-2 or TACAN, as selected

c. Copilot's Single Bar Pointer: VOR-1 or ADF, as selected

d. Copilot's Double Bar Pointer: VOR-2 or UHF/DF, as selected

3.4.3.4 VOR/ILS/Marker Beacon (Front-end Only). Dual VOR/LOC/GS/MKR receivers shall be installed for aircraft navigation.

3.4.3.4.1 Certification. The airplane shall be certificated for category II ILS operations. Each receiver shall be certified for primary navigation under IFR conditions. The receivers shall be certificated per TSO C34c/d (glideslope), TSO C35d (marker), TSO C36c/d (localizer) and TSO C40a/b (VOR).

3.4.3.4.2 Marker Beacon Antenna System. A Collins model 37X-2 marker beacon antenna, P/N 522-0854-003, shall be installed for use by the two navigation marker beacon receivers. An Adams-Russell model TU-50 power divider, P/N 9021, shall be used to connect the two marker receivers to the antenna.

3.4.3.4.3 Marker Controls. A marker test switch and a marker High-Low sensitivity switch shall be installed in the cockpit for each navigation marker receiver.

3.4.3.4.4 Marker Integration. The No. 1 marker beacon receiver lamp outputs shall be integrated into and displayed on the pilot

EFIS/FCS. The No. 2 marker beacon receiver lamp outputs shall be integrated into and displayed on the copilot EFIS/FCS.

3.4.3.4.5 VOR/LOC Antenna. The antenna pattern for the navigation antenna (pilot and copilot VOR receivers) shall be recorded. Transmissions from the VHF communications transceivers shall not degrade the accuracy or performance of the pilot and copilot VOR receivers with VOR/LOC RF input signal levels as low as 5 microvolts. This requirement shall apply to both radial and orbital flights.

3.4.3.5 ADF (Shared with AFIS). A Bendix model DFA-75A ADF receiver, P/N 2041168-7514, with Bendix model ANA-75B antenna, P/N 2041683-7505, shall be installed. The ADF antenna shall not be located in close proximity to "L band" pulse equipment antennas such as DME/TACAN/Transponder. There shall be no impulse type interference present in either the ADF bearing or ADF audio due to reception of "L band" signals by the ADF antenna.

3.4.3.6 TACAN (Shared with AFIS). A single TACAN Bearing receiver, FAA model FA76.28A, shall be installed.

3.4.3.6.1 Interface. The TACAN Bearing receiver shall be capable of simultaneously providing navigation guidance to both the pilot and the copilot while providing flight inspection data to AFIS.

3.4.3.6.2 Certification. The TACAN Bearing receiver shall be certified for primary navigation under IFR conditions.

3.4.3.6.3 Cockpit Tuning. The TACAN frequency control unit (or pilot's FMS) shall be capable of tuning all 128 "X" channels and 128 "Y" channels, independently of NAV equipment.

3.4.3.6.4 Self Test. The aircraft shall have a means for activating the TACAN Bearing receiver's self test mode. The self test switch shall be of the momentary type and shall be easily accessed by both pilots.

3.4.3.6.5 Tuning Transfer. An independent, lighted, push button switch shall be provided for transferring TACAN tuning control from the cockpit to the AFIS NCU. The switch shall be located on the instrument panel, in clear view and easy reach of both pilots. The switch shall have a split legend: a green legend, "MANUAL," shall indicate cockpit control; and an amber legend, "AUTO," shall indicate AFIS control. The switch annunciation shall be duplicated at the AFIS console.

3.4.3.7 DME (Front-end Only). A minimum of two and a maximum of three DME's shall be installed for front-end navigation. The actual number of units installed (two or three) shall be determined

by the contractor, based upon the operational requirements stated herein. The DME's shall be certified per TSO-C66b.

3.4.3.7.1 Operational Requirements. Whenever TACAN, VOR, ILS, or MLS is selected as the navigation source into either EFIS, corresponding DME information shall be presented on the appropriate EHSI and corresponding DME identification audio shall be routed into the appropriate channel of the audio integration/intercom system. Additional correlated DME information shall be displayed on each EHSI for each RMI bearing pointer that is driven by TACAN or VOR.

3.4.3.7.2 Tuning. Tuning of the DME's shall be performed automatically via FMS's or paired control heads (TACAN, VOR/ILS, and MLS) to meet the operational requirement described above.

3.4.3.7.3 DME Hold. A "DME Hold" or equivalent capability shall exist such that each pilot shall be capable of tuning his DME independently of his NAV/ILS/MLS equipment if and when he so desires.

3.4.3.7.4 Self Test. The aircraft shall have a means for activating the self test mode independently for each DME. Self test switches shall be of the momentary type and shall be easily accessed by both pilots.

3.4.3.7.5 Performance. The electronic horizontal situation indicator (EHSI) distance readout shall not lag data exiting the corresponding airborne DME by more than 0.3 seconds and shall not be in error by more than ±0.1 nautical miles when connected to a calibrated signal of -86 dBm at the antenna connector. When flying inbound and outbound radials at any groundspeed, the distance readout shall step uniformly and shall not fluctuate backwards. This requirement shall be met at any signal level above the DME's sensitivity threshold.

3.4.3.7.6 Antennas. All DME antennas shall be installed on the bottom of the fuselage, a minimum of 36 inches from any Comm, ADF, or other L-band antennas.

3.4.3.7.7 Suppression. The suppressor signal from each DME shall be paralleled to all other DME, transponder, and TACAN equipment installed in the aircraft.

3.4.3.8 MLS (Shared with AFIS). Dual MLS receivers, Bendix P/N 8095300-1110, shall be installed and shall operate simultaneously and independently.

3.4.3.8.1 Interface. Each MLS receiver shall be capable of simultaneously providing navigation guidance to both the pilot and the copilot while providing flight inspection data to AFIS.

3.4.3.8.2 Certification. The airplane shall be certificated for MLS precision approaches, under IFR night and day conditions, with no restrictions.

3.4.3.8.3 Cockpit Tuning and Control. Each MLS receiver shall have a dedicated control unit, Bendix P/N 8095301-1201, installed in a cockpit location easily readable and easily accessible by both pilots.

3.4.3.8.4 Tuning Transfer. Two independent, lighted, push button switches (one for MLS-1 and one for MLS-2) shall be provided for transferring MLS tuning control from the cockpit to the AFIS NCU. Both switches shall be located on the instrument panel, in clear view and easy reach of both pilots. Each switch shall be split legend: a green legend, "MANUAL," shall indicate cockpit control; and an amber legend, "AUTO," shall indicate AFIS control. Each switch annunciation shall be duplicated at the AFIS console.

3.4.3.8.5 Performance. The dual MLS system shall be installed and operate in accordance with category II ILS requirements as specified in FAR 91, Appendix A.

3.4.3.9 Loran-C (Front-end Only). The Loran-C sensor shall be instrument flight rule (IFR) approved for en route, terminal, and non-precision approaches. The Loran-C sensor shall be certificated in accordance with TSO C60b.

3.4.3.10 Omega (Front-end Only) (MSR and MM). A single VLF/Omega system, certified in accordance with TSO C120, shall be installed and interfaced to the FMS, EFIS, and autopilot systems. The VLF/Omega shall be certified for use as an area navigation system under IFR conditions within the National Airspace System (NAS) and over the North Atlantic in accordance with AC 20-101C and AC 120-33.

3.4.3.11 UHF Direction Finding. A Collins DF-301E antenna, P/N 622-0902-005, shall be installed and shall operate in conjunction with the UHF Comm receiver to perform direction finding. Loss from the antenna to the input connector of the UHF transceiver shall not exceed 2.5 dB at 400 MHz.

3.4.4 Global Positioning System/Inertial Reference System (GPS/IRS). A combination GPS/IRS system (Honeywell YG1854 system) shall be installed. GPS/IRS equipment shall act as sensors for one or more long range navigation systems (AFIS RNAV function, FMS-1, and FMS-2); no GPS or IRS CDU's shall be installed.

3.4.4.1 System Configuration (MSR and MM). A single IRU shall be installed and connected to a single GPS sensor.

3.4.4.2 System Configuration (LSR). Triple IRU's shall be installed and connected to dual GPS sensors. Each of the three IRU's shall be connected to each of the two GPS sensors using isolated data buses.

3.4.4.3 Equipment Configuration Control. The GPS/IRS systems shall consist of the components listed below.

a. IRU Honeywell model HG1095GC03. IRU provides the special outputs and high precision required by AFIS.

b. IRU Mode Control - Single Honeywell model CG1042AB (MSR & MM)

c. IRU Mode Control - Triple Honeywell model CG1227AC (LSR)

d. Battery Unit URDC model AMPS-2000

e. GPS Sensor Honeywell model HG2021

3.4.4.4 Along Track Output. In addition to providing the standard GPS GPIRU outputs, the GPIRU shall be installed so as to provide a special along track pulse (0.1 nautical mile) to be recorded on the AFIS printer/plotter.

3.4.4.5 Other Requirements. The GPIRU's shall provide aircraft attitude, true heading, and drift angle, etc., to the flight instruments as needed.

3.4.5 Area Navigation (RNAV).

3.4.5.1 AFIS RNAV. AFIS shall be installed to provide two-dimensional space positioning and lateral area navigation using information from various navigation sensors.

3.4.5.1.1 Interface. The AFIS RNAV function shall be capable of simultaneously providing area navigation guidance to both the pilot EFIS/FCS and the copilot EFIS/FCS while performing flight inspection tasks (reference figure 1). Interface to the dual EFIS/FCS shall be accomplished via existing AFIS NCU interface provisions, a contractor developed external interface unit, or additions to AFIS NCU software. Any changes to the AFIS NCU software required by the contractor shall meet all requirements listed below.

a. The contractor shall be responsible for furnishing new AFIS NCU software.

b. The revised software shall not impact any of the existing AFIS NCU tasks, shall not use more than 2 percent of the total NCU processing time, and shall be completely transparent to installations in other aircraft.

c. All new software shall be developed, tested, and documented in accordance with DO-178A and shall be categorized as "essential."

3.4.5.1.2 Certification. The AFIS RNAV installation shall be certificated to show compliance with FAR's 25.1301, 25.1309, 25.1431, 25.1581, and 91.511 (overwater operations) for en route and approach use in IFR conditions. Refer to Advisory Circular AC 20-130 and 25-4.

3.4.5.1.3 Positioning Sensors.

3.4.5.1.3.1 GPS Inertial Reference Unit (GPIRU). The AFIS NCU shall receive positioning information and synthesized magnetic heading information from one GPIRU. Via the digital data bus, the GPIRU shall provide inertial data, GPS data, and hybrid inertial/GPS data to the AFIS NCU.

3.4.5.1.3.2 AFIS DME. A DME, dedicated to support AFIS, shall be installed. The DME shall be tuned by the AFIS NCU and its distance information shall be routed to the AFIS NCU only. The DME shall be certified per TSO-C66b and shall meet all requirements of ARINC 709. The DME antenna shall meet the following requirements.

a. The antenna system shall meet all applicable requirements of ARINC 709.

b. The antenna shall be installed on the bottom of the fuselage, a minimum of 36 inches from any Comm, ADF, or other L-band antennas. The antenna shall be installed in such a manner as to provide at least 40 dB of isolation from any Comm, ADF, or other L-band systems.

3.4.5.1.3.3 Air Data System (ADS). The pilot's ADS shall provide static source error correction (SSEC), baro altitude, and true airspeed (TAS) data to the AFIS NCU via an ARINC 429 data bus. This data shall be used for flight inspection analysis.

3.4.5.1.4 Cockpit Control. One AFIS CDU, Parker/Gull P/N 372-045-003, shall be installed in the cockpit, easily readable and accessible by both pilot and copilot.

3.4.5.1.5 Configuration Control. The AFIS NCU shall be Parker/Gull P/N 367-049-001 containing firmware revision (I) or subsequent. The software supplied with the AFIS NCU shall contain Parker/Gull part numbers as follows.

a. 555-050-001/-004(*): RNAV and Flight Inspection Program with Analog Steering Outputs

b. 555-050-012/-013(*): RNAV and Flight Inspection Program with ARINC 429 Steering Outputs

3.4.5.1.6 Data Loader. The RNAV operational program, the flight inspection operational program, and the facility data base shall be periodically loaded into the AFIS NCU via an ARINC 615 data loader. The data loader shall be installed in a location easily accessible to the flight inspection technician.

3.4.5.2 Flight Management System (FMS). The LSR aircraft shall have dual FMS's installed and the MSR and MM aircraft shall have a single FMS installed. Each FMS shall be interfaced to both EFIS/FCS's.

3.4.5.2.1 Certification. The systems shall be certified to show compliance with FAR's 25.1301, 25.1309, 25.1431, 25.1581, and 91.511 (overwater operations) for en route and approach use under IFR conditions. Reference advisory circulars AC 20-130 and AC 25-4.

3.4.5.2.2 Long Range Positioning Sensors. Each FMS shall be capable of simultaneously utilizing long range positioning information from Loran-C, Omega (MSR and MM), and at least one GPIRU.

3.4.5.2.3 VOR/DME Operation. Each FMS shall be fully integrated with both pilot's and copilot's VOR and DME navigation systems and air data computers to provide DME-DME and VOR-DME area navigation.

3.4.5.2.4 Vertical Navigation. Each FMS shall provide vertical navigation capabilities.

3.4.5.2.5 FMS Navigation Computer Unit. The FMS NCU shall accommodate an IFR certified comprehensive world-wide navigation data base to include holding patterns, standard instrument departures (SID), standard terminal arrivals (STAR), low level "Victor" routes, high level "Jet" routes, and low/high level intersections. The database shall contain airport runway information for all hard surfaced runways with a useable length of at least 4,000 feet. The navigation data base shall be capable of being updated in accordance with FAR currency requirements. The FMS NCU shall be capable of computing all pilot secondary navigational computations, such as waypoints and courses, and fuel management data referenced to current or planned flight segments.

3.4.5.2.6 FMS Control Display Unit (CDU). Each FMS CDU shall have multi-color display presentation, display line select keys, and a full alphanumeric keyboard with appropriate dedicated function keys. The display screen shall have a minimum horizontal width of 4 inches.

3.4.5.2.7 FMS Data Transfer Unit (DTU). The DTU shall be installed in an easily accessible location either in the cockpit or in a non-flight inspection equipment rack in the cabin. The DTU shall provide a means for transferring data base updates, flight plans, and other optional programming data to each FMS. The DTU shall use 3-1/2 inch high density (1.44 MByte formatted) floppy disks created on IBM compatible personal computer systems using DOS 3.3 (or subsequent version).

3.4.6 Flight Control System.

3.4.6.1 Electronic Flight Instrumentation System (EFIS). A dual EFIS shall be installed consisting of at least four display tubes: two electronic attitude display indicators (EADI) and two electronic horizontal situation indicators (EHSI). Each EFIS display unit shall be at least 5 inches by 5 inches in size.

3.4.6.1.1 Weather Radar. Each EHSI, as installed, shall be capable of displaying weather radar information through use of an appropriate display controller.

3.4.6.1.2 Certification. Each EFIS shall be certified to meet the applicable portions of TSO's C3b, C4c, C6c, C34c, C36c, C40b, C41c, C52a/b, C63c, C66b, and C87. Each EFIS, as installed in the aircraft, shall meet the requirements of AC 25-11.

3.4.6.1.3 Angle-of-Attack/Airspeed Display. Provisions shall be installed to display either angle-of-attack or airspeed reference on the EFIS displays.

3.4.6.2 Flight Control System (FCS). Dual flight director/autopilot systems shall be installed and shall meet the requirements listed in table IV. The flight director systems shall be certified per TSO C52a/b and the autopilot system shall be certified per TSO C9c.

3.4.6.2.1 Selectable Modes of Operation. The flight director/autopilot shall operate in at least the following modes, each of which shall be clearly annunciated.

a. Go Around (GA)

b. Pitch Sync (PCH SYN)

c. Indicated Airspeed or Mach (IAS or MACH)

d. Altitude Hold (ALT HLD)

e. Heading (HDG)

f. Navigation/Localizer (NAV/LOC) (including MLS)

g. Approach (APPR) (including MLS)

h. Glideslope (GS)

3.4.6.2.2 Mode Selection. The PCH SYN switches shall be located on the control column. The GA switch shall be located either on the control column or throttle lever. Flight director modes, identified as items c. through h. in the preceding paragraph, shall be selectable on each flight director mode selector.

3.4.6.2.3 Performance. While flying an autopilot coupled approach on a category II ILS facility, the aircraft shall be within 25 microamperes of the localizer centerline from localizer intercept to the outer marker. From the outer marker to the runway threshold, the tolerance shall decrease linearly to ±11 microamperes at the runway threshold. The aircraft shall meet this requirement with a 2-sigma probability.

3.4.6.3 Systems Integration.

3.4.6.3.1 Lateral Navigation. Lateral navigation sources for each EFIS/FCS shall consist of those listed below.

	Pilot Side	Copilot Side
a.	NAV-1	NAV-1
b.	NAV-2	NAV-2
c.	MLS-1	MLS-1
d.	MLS-2	MLS-2
e.	FMS-1	FMS-1 (FMS-2 on LSR aircraft)
f.	AFIS RNAV	AFIS RNAV
g.	TACAN	TACAN
h.	ADF	ADF
i.	SPARE	SPARE
j.	SPARE	SPARE

3.4.6.3.2 Vertical Navigation. Vertical navigation modes for each EFIS/FCS shall consist of those listed below.

	Pilot Side	Copilot Side
a.	Altitude Hold	Altitude Hold
b.	Vertical Speed	Vertical Speed
c.	IAS or Mach[1]	IAS or Mach[1]
d.	G/S-1	G/S-1
e.	G/S-2	G/S-2
f.	MLS-1	MLS-1
g.	MLS-2	MLS-2
h.	FMS-1	FMS-1 (FMS-2 on LSR aircraft)

[1] A "flight level change" mode shall be considered an acceptable alternative.

3.4.6.3.3 EFIS RMI Pointers. EFIS electronic horizontal situation indicator (EHSI) RMI bearing pointers shall display the following information.

a. Pilot's EHSI Single Bar Pointer: VOR-1, ADF, or FMS-1, as selected

b. Pilot's EHSI Double Bar Pointer: VOR-2, TACAN, or FMS-2, as selected

c. Copilot's EHSI Single Bar Pointer: VOR-1, ADF, or FMS-1, as selected

d. Copilot's EHSI Double Bar Pointer: VOR-2, TACAN, or FMS-2, as selected

3.4.6.3.4 Air Data/Compass Sources.

3.4.6.3.4.1 Air Data Computers. Switching provisions shall be made for each pilot to manually select either of the two air data computers. Appropriate annunciation shall be provided.

3.4.6.3.4.2 Attitude. Switching provisions shall be made for each pilot to manually select an alternate aircraft attitude source. Appropriate annunciation shall be provided.

3.4.6.3.4.3 Compass Sources. Switching provisions shall be made for each pilot to manually select either of the two magnetic heading sources. Switching shall also be provided for each pilot to manually select true heading data from an IRS in place of the magnetic heading data. Appropriate annunciation shall be provided. Selection of heading sources shall be restricted as follows.

a. True heading shall never be displayed on the mechanical RMI's.

b. True heading shall only be selectable for the EFIS/FCS when an RNAV system (AFIS RNAV, FMS-1, and FMS-2) is selected as the lateral guidance source and the guidance data is relative to true heading.

c. TRUE/MAG annunciation shall always reflect which heading reference is currently being used by the EFIS/FCS.

d. The autopilot and the coupled EFIS and flight director systems shall use the same heading information at all times.

3.4.6.4 ILS Offsets. The aircraft shall be capable of flying glideslope and localizer offsets as described below. Reference figure 4.

a. The aircraft shall have installed a means to select and fly an autopilot coupled approach with a glideslope guidance offset of one dot (75 microamps) above and one dot below glidepath.

b. The aircraft shall have installed a means to select and fly an autopilot coupled localizer (no glideslope guidance) with a guidance offset of two dots (150 microamps) left and two dots right of centerline.

c. The switch/annunciator assembly shall be installed in full view of both pilots to warn of the nonstandard configuration whenever either offset has been selected.

d. Concurrent selection of both glideslope offset and localizer offset shall not be permitted.

3.4.7 Master Warning System. The aircraft shall be equipped with a cockpit master warning system.

3.4.8 Transponder/TCAS/IFF.

3.4.8.1 Air Traffic Control (ATC) Transponder. Dual Mode-S ATC transponders shall be installed. Each transponder shall be a Bendix/King model TRA-67A, P/N 066-01127-1201. A single combina-

tion transponder/TCAS control unit, Bendix model CTA-81B, shall also be installed. The transponder installation shall comply with Advisory Circular AC 20-131 and shall incorporate the features described below.

3.4.8.1.1 Automatic Overload Control (AOC). There shall be a lighted, split legend, push button switch on the instrument panel that controls the automatic overload function as illustrated in figure 3. The switch legends shall be "NORMAL" and "FLT INSP." An AOC annunciator shall be installed adjacent to the "NORMAL/FLT INSP" switch. The annunciator shall be driven by the transponder's AOC ANNUNCIATOR output as illustrated in the figure and shall be labelled "ATC OVERLOAD." The "NORMAL" legend light shall be green and the "FLT INSP" legend light shall be amber. The "ATC OVERLOAD" legend light shall be amber.

3.4.8.1.2 Sensitivity Selection. External RF attenuators (one for each of the two antennas), described in 3.4.8.2, shall be controlled by a lighted, split legend, push button switch as illustrated in figure 3. The switch legends shall be "NORMAL" and "LOW POWER." The "NORMAL" legend light shall be green and the "LOW" legend light shall be amber. The transponder's receiver is capable of two internally adjustable sensitivities. The desired sensitivity shall be selected, via the transponder LO SENS input, by the state of both the "NORMAL/LOW" power switch and the "NORMAL/FLT INSP" switch as illustrated in figure 3.

3.4.8.1.3 Additional Switch/Annunciator Requirements. The switches and annunciators described above, "NORMAL/FLT INSP," "NORMAL/LOW POWER," and "ATC OVERLOAD," shall be grouped together, preferably near the TCAS/transponder control unit, and shall be labelled as "TRANSPONDER CONTROLS."

3.4.8.2 Transponder Antennas. Dual transponder antennas, model AT-741B/A, or equivalent, shall be installed: one on top of the aircraft and one on the bottom.

3.4.8.2.1 Installation. Refer to figure 5. Each of the two antenna systems (top and bottom) shall have a programmable attenuator, Hewlett-Packard P/N 33304D-000, installed between the transponder and the antenna in an accessible location in the F.I.